Soil name: Fortification

Overview

Fortification soils occur on about 1200 ha on undulating to steep slopes east of the lower Mataura river in southern Southland. They are formed in a moderately deep layer of loess overlying tuffaceous greywacke bedrock. Fortification soils are imperfectly to moderately well drained. They have slightly deep rooting depth and moderately high water holding capacity that is limited by the graveliness and bedrock that commonly occurs within in the lower subsoil. They are strongly leached soils with acidic subsoils, high P-retention, and low available nutrients. At present they are used for pastoral farming with sheep and beef cattle. Climate is cool temperate with regular rainfall. Soils seldom dry out.

Fortification profile

Physical properties

Fortification soils have a slightly deep rooting depth that is restricted by bedrock. Plant available water capacity is moderately high, with good aeration and permeability. Texture is a silty clay loam in all horizons. Topsoil clay content is 30–38%. Soils are slightly gravelly in the upper horizons, grading to extremely gravelly subsoil and bedrock between 45 and 90cm depth.

Fertility properties

Topsoil organic matter levels are 11–14%; P-retention 75–90%; pH moderate (high 5s) in the topsoil. Subsoil pH values tend to decrease (<5.5). Cation exchange values are high but base saturation is low. Available calcium and magnesium levels are moderate in the topsoil but low in the subsoil. Potassium and reserve phosphorus levels are low. Micronutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Fortification soils are:

- Pukerau: well drained, shallow Allophanic soil; with bedrock at <45cm depth
- Otaraia: well drained, deep Brown soil; with no bedrock within 90cm depth
- Haldane: imperfectly drained, deep Brown soil; with no bedrock within 90cm depth
- Scrubby Hill: imperfectly drained, deep Brown soil with podzolised properties; has thin iron pans and is strongly acid with pH of <4.9

Some soils that have similar properties to Fortification soils are:

- Craigdale : Brown soil that is moderately leached, with P-retention of 40–60%
- McNab: Brown soil that has a strongly acid subsoil (pH <4.9); bedrock is more weathered.
- Waiarikiki: Brown soil that is stongly leached, with P-retention of >85%; often formed onto gravelly colluvium

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	minimal	These soils have a minimal vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the good drainage, high clay, organic matter, and P-retention levels.
Nutrient leaching	moderate	These soils have a moderate vulnerability to leaching to groundwater. This rating reflects the moderately high water-holding capacity, offset by the good drainage, and permeability of the soil.
Topsoil erodibility by water	minimal	Due to the high organic matter and clay content, topsoil erodibility in these soils is minimal. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	minimal	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	slight	These soils have a slight vulnerability to waterlogging during wet periods. This rating reflects the good drainage, and permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

FoH2 (Fortification hilly moderately deep)

Versatility evaluation for soil FoH2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Unsuitable	Hilly slope
Arable	Unsuitable	Hilly slope
Intensive pasture	Limited	Hilly slope
Forestry	Limited	Restricted rooting depth

FoS2 (Fortification steep moderately deep): as above, with steep slopes being the main limitation for all landuses plus restricted rooting depth for forestry.

FoU2 (Fortification undulating moderately deep)

Versatility evaluation for soil FoU2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Restricted rooting depth
Arable	Moderate	Vulnerability to leaching to groundwater; restricted rooting depth
Intensive pasture	Moderate	Vulnerability to leaching to groundwater; subsoil acidity.
Forestry	Limited	Restricted rooting depth

FoR2 (Fortification rolling moderately deep): as above, but arable landuse has limited versatility rating due to rolling slope

Management practices that may improve soil versatility

- Management of nutrient applications so as to minimise leaching losses